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Proceedings of the Zonal Advisory Process for Smooth Skate and Thorny Skate Pre-COSEWIC meeting

Compte rendu du processus d'évaluation zonale pour la réunion pré-COSEPAC concernant la raie épineuse et la raie à queue de velours

January 11-13, 2011
St. John's, NL

Du 11 au 13 janvier 2011
St. John's (Terre-Neuve-et-Labrador)

Meeting Chairperson
Keith Clarke

Président de réunion
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Foreword

The purpose of these Proceedings is to document the activities and key discussions of the meeting. The Proceedings may include research recommendations, uncertainties, and the rationale for decisions made during the meeting. Proceedings may also document when data, analyses or interpretations were reviewed and rejected on scientific grounds, including the reason(s) for rejection. As such, interpretations and opinions presented in this report individually may be factually incorrect or misleading, but are included to record as faithfully as possible what was considered at the meeting. No statements are to be taken as reflecting the conclusions of the meeting unless they are clearly identified as such. Moreover, further review may result in a change of conclusions where additional information was identified as relevant to the topics being considered, but not available in the timeframe of the meeting. In the rare case when there are formal dissenting views, these are also archived as Annexes to the Proceedings.

Avant-propos

Le présent compte rendu a pour but de documenter les principales activités et discussions qui ont eu lieu au cours de la réunion. Il contient des recommandations sur les recherches à effectuer, traite des incertitudes et expose les motifs ayant mené à la prise de décisions pendant la réunion. Le compte rendu peut aussi faire l'état de données, d'analyses ou d'interprétations passées en revue et rejetées pour des raisons scientifiques, en donnant la raison du rejet. Bien que les interprétations et les opinions contenues dans le présent rapport puissent être inexactes ou propres à induire en erreur, elles sont quand même reproduites aussi fidèlement que possible afin de refléter les échanges tenus au cours de la réunion. Ainsi, aucune partie de ce rapport ne doit être considérée en tant que reflet des conclusions de la réunion, à moins d'indication précise en ce sens. De plus, un examen ultérieur de la question pourrait entraîner des changements aux conclusions, notamment si l'information supplémentaire pertinente, non disponible au moment de la réunion, est fournie par la suite. Finalement, dans les rares cas où des opinions divergentes sont exprimées officiellement, celles-ci sont également consignées dans les annexes du compte rendu.

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SUMMARY

A Regional Advisory Process (RAP) for the Smooth Skate and Thorny Skate Pre-COSEWIC Peer Review Meeting was held on 11-13 January 2011 at the Comfort Inn, St. John's, Newfoundland and Labrador (NL). The requirement for a Pre-COSEWIC peer review meeting is triggered when COSEWIC (Committee on the Status of Endangered Wildlife in Canada, a non-government scientific advisory body that has been established under Section 14(1) of the *Species at Risk* Act, SARA) schedules a species to be assessed for the risk of extinction, the scientific basis for listing a species under SARA. The assessment initiates a regulatory process whereby the competent Minister must decide whether or not to accept COSEWIC's assessment and add a species to Schedule 1 of SARA, which would result in legal protection for the species under the Act. If the species is already on Schedule 1 of SARA, the Minister may decide to keep the species on the list, reclassify it as per the COSEWIC assessment, or to remove it from the list (Section 27 of SARA). Two species of skate, Smooth Skate (*Malacoraja senta*) and Thorny Skate (*Amblyraja radiata*) have been scheduled by COSEWIC for assessment. Fisheries and Oceans Canada (DFO), as a key repository of information on marine species, is to provide COSEWIC with the best information available to ensure that an accurate assessment of the status of a species can be undertaken and a Pre-COSEWIC evaluation is completed to provide the information.

The purpose of this Pre-COSEWIC meeting was to peer-review DFO information relevant to the COSEWIC status assessment for *Malacoraja senta* and *Amblyraja radiata* in Canadian waters, considering data related to the status and trends of, and threats to these species inside and outside of Canadian waters, and the strengths and limitations of the information. This information will be made available to COSEWIC, the author(s) of the species status report, and the co-chairs of the applicable COSEWIC Species Specialist Subcommittee.

Participants included DFO staff from Science (NL, Gulf, Maritimes, and National Capital regions), Fisheries and Aquaculture Management (NL Region), and Species at Risk Management (NL Region), as well as representatives from the Marine Institute of Memorial University, The University of New England, Fisheries, Food and Allied Workers Union (FFAW) and the COSEWIC author. The meeting rapporteur was Dr. F. Mowbray.

These proceedings contain a summary of presentations made during the meeting and the summaries of related discussions. Included as appendices are the Terms of Reference, agenda, and a list of participants.

Additional information on this Pre-COSEWIC is available in the Canadian Science Advisory Secretariat Research Document series.

SOMMAIRE

Un processus de consultation régionale a été mené du 11 au 13 janvier 2011, au Comfort Inn, à St. John's (Terre-Neuve-et-Labrador), dans le cadre de la réunion d'examen par des pairs pré-COSEPAC concernant la raie épineuse et la raie à queue de velours. Une réunion d'examen par des pairs pré-COSEPAC doit avoir lieu lorsque le COSEPAC (Comité sur la situation des espèces en péril au Canada, un organisme scientifique consultatif indépendant qui a été constitué en vertu du paragraphe 14(1) de la *Loi sur les espèces en péril* [LEP]) prévoit évaluer le risque d'extinction d'une espèce, le fondement scientifique pour l'inscription d'une espèce en vertu de la LEP. L'évaluation est le point de départ d'un processus réglementaire par lequel un ministre compétent doit décider d'accepter ou non l'évaluation effectuée par le COSEPAC et d'ajouter une espèce à l'annexe 1 de la LEP, ce qui garantirait la protection de l'espèce en vertu de la LEP. Dans le cas où l'espèce figure déjà à l'annexe 1 de la LEP, le ministre peut décider de maintenir l'inscription de l'espèce, de la reclassifier selon les résultats de l'évaluation par le COSEPAC, ou de la radier de la Liste (article 27 de la LEP). Deux espèces de raies, *Malacoraja senta* et *Amblyraja radiata*, ont été choisies par le COSEPAC aux fins d'évaluation. Le ministère des Pêches et des Océans (MPO), en tant que principal archiviste de l'information sur les espèces marines, doit fournir au COSEPAC la meilleure information disponible pour qu'une évaluation précise de la situation d'une espèce puisse avoir lieu et qu'une évaluation préalable à celle du COSEPAC soit menée en vue de fournir les renseignements nécessaires.

Cette réunion pré-COSEPAC visait à faire examiner par les pairs l'information du MPO pertinente pour l'évaluation de la situation par le COSEPAC de la raie à queue de velours (*Malacoraja senta*) et de la raie épineuse (*Amblyraja radiata*) dans les eaux canadiennes, y compris les données sur la situation de ces espèces, les tendances observées et les menaces qui pèsent sur elles, tant dans les eaux canadiennes que dans les eaux étrangères, ainsi que les points forts et les limites de cette information. L'information sera ensuite mise à la disposition du COSEPAC, des auteurs du rapport sur la situation des espèces et des coprésidents du sous-comité pertinent de spécialistes des poissons.

Parmi les participants, mentionnons le personnel de la Direction des sciences (régions de Terre-Neuve-et-Labrador, des Maritimes et de la capitale nationale), de la Gestion des pêches et de l'aquaculture (région de Terre-Neuve-et-Labrador) et de la Gestion des espèces en péril (région de Terre-Neuve-et-Labrador), de l'Institut maritime de l'Université Memorial, de l'University of New England et de l'Union des pêcheurs de Terre-Neuve, ainsi que l'auteur du rapport du COSEPAC. Le rapporteur de la réunion était F. Mowbray.

Le présent compte rendu résume les présentations effectuées pendant la réunion ainsi que les discussions tenues à propos de celles-ci. Les cadres de référence, l'ordre du jour et la liste des participants figurent en annexe du compte rendu.

De plus amples renseignements sur cette réunion pré-COSEPAC se trouvent dans la série des documents de recherche du Secrétariat canadien de consultation scientifique.

INTRODUCTION

Participants were welcomed by the Chair and provided with an overview of the Canadian Science Advisory Secretariat (CSAS) Science Advisory Process and the background on SARA and the Pre-COSEWIC process. The main purpose of the zonal advisory process (ZAP) was to peer-review DFO information relevant to the COSEWIC status assessment for Thorny and Smooth Skate. The Chair also reviewed the Terms of Reference (TOR; Appendix 1) and the meeting agenda (Appendix 2) with participants.

MEETING PROCEEDINGS SMOOTH SKATE

SMOOTH SKATE, ABUNDANCE ESTIMATES – NL REGION

Presenter: Mark Simpson, DFO Science, NL Region

Abstract

Decline in abundance and reduction in the extent of distribution have been observed in several Smooth Skate (*Malacoraja senta* Garman 1885) populations inhabiting Canadian waters, despite no directed commercial fisheries for this species. This paper presents the most recent information regarding the distribution and abundance of *M. senta* in Newfoundland and Labrador waters. The primary purpose of this paper is to provide this information to the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) for use in formulating and evaluating conservation and management strategies for this species in terms of risk of extinction.

Independent data series based on spring and fall bottom trawl survey catches and commercial fisheries statistics covering the distribution of *M. senta* in Northwest Atlantic Fisheries Organization (NAFO) Div. 2HJ3KLMNOPs indicate that this species is comprised of several geographically distinct and persistent concentrations (each referred to here as a designatable unit or DU). These concentrations have experienced different trajectories in terms of abundance and distribution trends, but also have displayed common features such as thermal preferences and size-dependent distributions. The main concentration was centered in Div. 2J3K (Funk Island Deep DU) until the 1980s, but experienced substantial declines in abundance (juveniles and adults) and area of occupancy thereafter; although some population recovery has been detected since the mid-2000s. Two other smaller skate concentrations located in Div. 2H (Hopedale Channel DU) and Div. 3M (Flemish Cap DU) displayed spatio-temporal trends similar to those observed in the Funk Island Deep DU. In contrast, *M. senta* located in Div. 3OPs (Laurentian Channel DU) displayed relatively stable trends in abundance and distribution, and increasing trends have been detected during the last decade.

Several aspects of *M. senta* status in Newfoundland and Labrador waters remain uncertain; largely due to partial knowledge of population structure and biology, as well as the impacts of commercial fisheries and environmental variability.

Discussion

There was some discussion whether the division of data into juveniles and adults based on a 48 cm cut-off was appropriate for all areas within the range of the species. Length distribution within the juvenile population has not been examined but may provide some insight into whether

this number was in the right range. It was acknowledged that a change in size at maturity could bias results; however, with only 700 specimens sampled in the NL Region it cannot be addressed at this point in time. The maximum age of individuals in the population is likely 11 years so generation time would be considered to be about 16 years. It was noted that the estimates of abundance in NAFO Div. 3NOPs (Southern Grand Banks) for 2006 does not include Subdiv. 3Ps, hence is lower due to the missed area. Overall, for Div. 3NOPs there was an agreement that there has been some increase in abundance of adults while juveniles remain stable.

SMOOTH SKATE, COMMERCIAL FISHERY REMOVALS OF SMOOTH SKATE, 1985-2009 – NL REGION

Presenter: Carolyn Miri, DFO Science, NL Region

Abstract

Commercial fishery removals of Smooth Skate were investigated for 1985-2009. There have been no directed fisheries anywhere for this species to date. At-sea speciated catches and discarding of Smooth Skate in Canada's Exclusive Economic Zone (EEZ) were investigated by NAFO Division using the Canadian Fisheries Observer database. Observed catch estimates in Div. 3NOP averaged 54 tons annually in 1993-2000, and 9 t over 2001-2003; becoming insignificant after 2003. Observed catches remained insignificant in Subarea 2 and Div. 3KL. Canadian Fisheries Observers constitute the only source of speciated skate catch information, and discard data at sea (discarding always occurs unreported). At-sea identification of skates remains difficult for commercial fishers, who thus report their landings as "skates-unspecified".

Discussion

There has never been a directed fishery for Smooth Skate. Trends in bycatch rates in the commercial fisheries may be a result of species mis-identification, as it does not make sense in reference to fishing effort, e.g., lower catches when effort was high in earlier periods. Observers became more adept at identifying and differentiating skate species over time. Observer estimated bycatch rates have not been looked at in tandem with effort. The otter trawl did not catch larger fish as observed in gillnet and longline catches. It was noted that Observers' length frequency data came from trawls directing for redfish (*Sebastes* sp.), gillnets directing for Monkfish (*Lophius americanus*), and longlines directing for Thorny Skate. Patterns of length distribution from Observer's commercial catch data is unexpected (size records exceeds known size distribution). Although Canadian spring surveys in Div. 3LNOPs have caught 82 cm Smooth Skates (with confirmed species identifications), and commercial gillnet and longline gear can catch the longest lengths of a skate species' size range, Smooth Skate specimens of approximately 90+ cm TL in Div. 3O are questionable and may represent other skate species.

It was noted by a participant that the mortality rate among discards from the commercial fishery is high, with experiments in the United States (US) indicating that even healthy skate die within three days. Also it was found that the warmer the temperature the greater the mortality.

SMOOTH SKATE, SURVEY CATCH DISTRIBUTION – NL REGION

Presenter: Luiz Mello, DFO Science, NL Region

Abstract

Smooth Skate catch rates from spring (1971-2010) and fall (1977-2010) bottom trawl surveys conducted in the NL Region were plotted in relation to geographic location (NAFO Divisions), depth, and seafloor temperature. These indices of relative abundance show that several assemblages of Smooth Skate occur in the study area. The main assemblage was centred in Div. 2J3K in the mid-1980s, but subsequently experienced a decline in relative abundance and extent of distribution, reaching low levels in the early 1990s, and remaining largely unchanged since then. Another main assemblage located in Div. 3NOPs remained near stable conditions for most of the 1970s and 1980s, followed by increases in relative abundance since the mid-1990s. In addition, the fall catch rate distribution indicates the possibility of additional Smooth Skate assemblages in the Hopedale Channel (Div. 2H) and the Flemish Cap (Div. 3M). Smooth Skates were captured mostly at depths ranging between 50-600 m and temperatures of 0.1 to 7.1°C, suggesting that habitat associations are partially driven by temperature preferences, and that depth distribution is likely related to the water mass thermal profile over the NL shelf.

Discussion

The analysis was done by NAFO Division and it was suggested that Areas of Concentration rather than by NAFO Division would provide a better index. Plotting survey catch rates for juveniles and adults separately would help to clarify differential use of habitat, also plotting numbers per tow instead of kilogram per tow could be more informative as it relates to the local abundance of the species. For determining spawning distribution, plotting egg case distribution would be more helpful than using fecundities alone. The egg case data are available but not yet analyzed.

Some analysis had been done in 2006 (not presented here) regarding bimodal temperature preferences by Smooth Skate in NAFO Div. 3LNOPs and how changes in bottom temperature affect distribution. It was suggested that it would be useful to complete further analysis.

It was suggested a graph in the form of a cumulative distribution o-gives be presented with two lines, one for sets with skate catch and one for all sets. Some of this work has been done previously but not presented here. Alternatively, a General Additive Models (GAM) may be used to investigate skate catch as a function of depth or temperature examining the significance of depth or temperature on catch rate. It was observed that Thorny Skate appear to be moving up onto the bank in the fall and it was recommended plotting the cumulative distribution of Smooth Skate survey catch rates for longer time periods.

In general life history data are deficient for this stock and genetic analysis is needed to support DU designation as defined from distributional patterns.

SMOOTH SKATE, CENTRAL AND ARCTIC REGION

Author: Margaret Treble, DFO Science, Central and Arctic Region
Presenter: Mark Simpson, DFO Science, NL Region

Abstract

Smooth Skate have been identified as bycatch by fishery observers working onboard vessels fishing for Greenland Halibut (*Reinhardtius hippoglossoides*) and Northern Shrimp (*Pandalus borealis*) in Davis Strait (south of 68°N), although at very low levels. There have been no reports of Smooth Skate bycatch in the shrimp fishery since 2003 and bycatches in the Greenland Halibut fishery (<1 t in most years) have been primarily taken by the trawl fleet. Smooth Skate in Subarea 0 and Hudson Strait have been caught close to the boundary with Subarea 1 (Greenland waters) and Div. 2G (Newfoundland waters) and may reflect an extension of stocks from one or both of these areas. However, Smooth Skate have not yet been identified in surveys conducted by the Central and Arctic Region in NAFO Subarea 0 (since 1999) and Hudson Strait/Ungava Bay (2007 and 2009), and by the Northern Shrimp Research Foundation (NSRF) in Shrimp Fishing Areas 2 and 3 (since 2005). It is sometimes difficult to identify skates and it is possible that the bycatch in the Greenland Halibut and shrimp fisheries that have been identified as Smooth Skate may be Arctic Skate (*Amblyraja hyperborea*) or some other skate species. There has never been a directed fishery for skate in Subarea 0.

Discussion

There is limited scientific survey information for these areas. It was suggested the author should check to see if the research and fishery data are from the same time of year, and if Smooth Skate observations come from only a few observers. It was questioned whether Smooth Skate may have been confused with Arctic Skate and whether observers were qualified to differentiate these species.

SMOOTH SKATE, GULF REGION

Presenter: Doug Swain, DFO Science, Gulf Region

Abstract

Information on life history traits, trends in the abundance and distribution, and threats to persistence were presented for Smooth Skate (*Malacoraja senta*) in the southern Gulf of St. Lawrence (sGSL). A bottom-trawl survey, conducted each September since 1971, is the main source of information on the abundance and distribution of Smooth Skate in this area. This survey has broad coverage of the southern Gulf, extending from depths less than 20 m to those near 400 m. Analyses were restricted to the 24 strata fished since 1971, with adjustments to account for one or two missed strata in 1978, 1983, 1988, and 2003. No differences in fishing efficiency for Smooth Skate were detected between the four vessels or two gears (Yankee-36 and Western IIA bottom trawls) used to conduct this survey over its 40 year history. Catchability of Smooth Skate to the survey was greater at night, and night catches were adjusted to day catchability to maintain comparability with data from the 1971-1984 surveys (when fishing was in day only).

Based on data collected since 2005, length at 50% maturity was estimated to 47 cm for males and 45 cm for females. At a zonal review of information on Smooth Skate in Atlantic Canada held in October 2006, it was decided that 48 cm would be used as the length demarking mature

(≥48 cm) versus immature (<48 cm) individuals for all regions. The estimated lengths at 50% maturity for Smooth Skate in the southern Gulf are close to this value, and 48 cm was retained for the analyses presented here.

Smooth Skate occur in relatively deep areas of the southern Gulf, with highest densities occurring between depths of 150 and 300 m. There is little geographic segregation evident between length classes of Smooth Skate, and little seasonal variation in their geographic distribution in this area. There has been no long term trend in the area occupied by adult Smooth Skate (defined here as skates ≥ 48 cm in total length) over the 1971-2010 period. The area occupied by juveniles was smaller in the late 1970s and early 1980s than it has been since the late 1980s.

Trends in abundance also differ between juvenile and adult skates. There has been a decline in the abundance of large skate relative to small skate over the 1971-2000 period. Survey catch rates of juveniles tended to be relatively high in the 1990s compared to the period from the mid-1970s to the early 1980s. In contrast, survey catch rates of adults declined from relatively high levels in the 1970s to very low levels in the early 2000s, with an increase in recent years. The above average abundance of juveniles throughout much of the 1990s and 2000s despite below average spawner abundance suggests that juvenile mortality was relatively low during this period. The below-average adult abundance throughout much of the 1990s and 2000s despite strong recruitment suggests that adult mortality was relatively high during this period. Based on the regression of $\log_e$ catch rates against time, the linear trend in adult abundance is a 3% decline annually, corresponding to a 67% decline over the 40 year time series. Based on survey catch rates, it is possible that this decline has ceased.

Trawlable abundance is the mean catch per standard tow expanded to the survey area. Because catchability of skates to the survey gear is expected to be less than 100%, trawlable abundance is expected to be less than true abundance. Estimated trawlable abundance of mature skates declined from about 125,000 fish in the 1970s to 43,000 fish in the 2000s, based on day catchability. Based on night catchability trawlable abundance of mature skates averaged 104,000 fish in the 2000s.

There is no directed fishery for skates in the sGSL. Skate landings are not disaggregated to species. Reported landings are very low (<10 t in most years) and are likely mostly Thorny Skate. However, most of the skate catch is discarded at sea, and estimates of the discarded catch of Smooth Skate were not available for this meeting. Fishing effort for groundfish in the sGSL has been very low since the mid-1990s. Thus, while bycatch mortality may have been an important component of Smooth Skate mortality prior to the mid-1990s, it has likely been low since then.

Assuming that the proportion of the Smooth Skate population available to the sGSL survey has not changed over time, the survey abundance trends for juvenile- and adult-sized skates suggest that mortality decreased for juveniles and increased for adults in the 1990s and 2000s. A similar pattern is seen throughout the marine fish community of the sGSL. This is consistent with the hypotheses of release of small fish from predation following the collapse of large demersal fish and increased predation mortality of large fish due to increased Grey Seal (*Halichoerus grypus*) abundance.

Discussion

There did not appear to be any spatial segregation of sizes in the Gulf data. This is in contrast to the Grand Bank where size in the channel is smaller than on the slope. Gulf Region landings

data for skate are not disaggregated by species, and estimates of discarded catch have not yet been made. These data will be required for a Recovery Potential Assessment (RPA). There is currently very little fishing effort for groundfish in the southern Gulf, and this is counter to the observation of increasing mortality. In 1984-1988 low values of juveniles were observed in the survey, and it is unlikely that survey missed fish in these years that were outside the survey area, e.g., in the middle of the Laurentian Channel given the relationship between density and depth.

Reliable aging data are not yet available for Smooth Skate from the Gulf region. Estimated length at maturity in the southern Gulf is similar to the estimate for the eastern Scotian Shelf. The estimated age at 50% maturity of female Smooth Skate is 10 years for the Eastern Scotian Shelf. Assuming this value and a natural mortality of 0.2 yields generation time of approximately 15 years.

A decline in the abundance estimates over the first five to six years seems to drive the model. There was some discussion about the advantages of sub-setting the time period, as the decline was mostly in the first few years, and abundance being noisy but stable in recent times. There is some indication of increased adult mortality, a similar pattern is seen in Atlantic Cod (*Gadus morhua*). Increased natural mortality of adult southern Gulf cod in the 1990s and 2000s is hypothesized to be associated with increased predation by Grey Seals. There was no consensus to subset the time period and the decline rate calculation remained as presented.

The maximum age of Smooth Skate, aged 22 years, in the Southern Gulf is too high compared to other stocks (i.e., 15-17 years). Therefore, aging will require further analysis.

Reported landings of skates were unusually high (130 t) in 1974-1975. It was suggested that they may not be accurate (i.e., may be another species).

SMOOTH SKATE, MARITIMES REGION

Presenter: Jim Simon, DFO Science, Maritimes Region

Abstract

The status of Smooth Skate within the Maritimes Region was reviewed by examining data from DFO research vessel (RV) surveys, US RV surveys, Canadian industry science surveys, observer information from directed fisheries, and fisheries landings. These data suggest that Smooth Skate were broadly distributed throughout the Maritimes Region in the 1970s with persistent areas of concentration. In the 1980s and 1990s, abundance fell across the Scotian Shelf and subsequently continued to decline in NAFO Div. 4VW. In NAFO Div. 4X, abundance increased in the 2000s, primarily driven by an increase in the number of juveniles. The decline in abundance over the whole Scotian Shelf was 80% for mature individuals while the decline when all lengths are considered was 58%. Smooth Skate are uncommon on Georges Bank with only scattered reports on the edges of the northeast peak area of the Canadian Zone. There are no directed fisheries for Smooth Skate on the Scotian Shelf: although it is caught as bycatch in other fisheries. In Div. 4X, an examination of these other fisheries suggests that annual Smooth Skate bycatch was relatively stable at approximately 450 t from 1970 to 1992. Bycatch estimates declined in the 1990s as catches in the traditional cod, Haddock (*Melanogrammus aeglefinus*), Pollock (*Pollachius virens*), and flatfish fisheries were reduced. In the last decade, removals have been less than half of what had been taken previously. In Div. 4VsW, bycatch of Smooth Skate prior to 1992 was approximately 450 t and declined subsequently to 20 t per year due to the closures of the Atlantic Cod and Haddock fisheries as well as changes in the Silver

Hake (*Merluccius bilinearis*) fishery. Collectively, these data suggest that in Div. 4VW, Smooth Skate abundance is currently low but threats have been reduced to near zero and recruitment is increasing. In Div. 4X, Smooth Skate abundance has been increasing over the last 15 years at the same time that removals have decreased by about half. Recruitment to the population has been increasing over the same period on both the eastern and western Scotian Shelf.

Discussion

The NAFO Div. 4X abundance index declines and then recovers slightly over the three generation period; there was no consensus to apply a break point within the series.

Information on predation (bore holes) of skate purses was collected during the processing of skate purses, however, this information has not yet been analysed. Skate cases are collected opportunistically from summer and spring surveys. It was suggested that skate egg case abundance may be useful to track juvenile versus adult abundance.

The catchability of the survey gear may bias the ratio of adult versus juveniles present in the survey catches. However, there was no size segregation of Smooth Skate noted in the Scotian Shelf data. Cod surveys of deeper waters are available for analysis to examine this issue.

SMOOTH SKATE, NORTHERN GULF OF ST. LAWRENCE, 1978-2010

Author: Brigitte Bernier, DFO Science, Gulf Region
Presenter: Doug Swain, DFO Science, Gulf Region

Abstract

For the northern Gulf of St. Lawrence (nGSL), four different annual bottom trawl groundfish surveys have been examined as part of this review. In general, the surveyed area includes NAFO Div. 4RS, Subdiv. 3Pn as well as strata deeper than 100 fathoms in Div. 4T. The sampling methodology follows a depth-stratified random survey design. These series are not easily comparable because many variables have changed over time, including survey vessel, gear, time of year, and surveyed area. Catches for each survey series were adjusted to respective survey standard tow.

The *Gadus Atlantica* survey was conducted yearly in January from 1978-1994 with an Engels 145 trawl (no survey in 1982). The area surveyed was highly variable over the series, mainly due to ice cover. The average area covered is 62,550 km^2 with the smallest area in 1992 of 31,737 km^2 and the largest in 1980 with 100,400 km^2. There was good coverage of Subdiv. 3Pn and Div. 4R over the series while Div. 4T and Div. 4S were more variable. The estuary (strata 409 – 414) was not surveyed. The survey ended in 1994.

The *Lady Hammond* survey took place in August from 1984-1990. This survey used a Western IIA trawl. The total surveyed area was fairly constant from 1985 to 1989 averaging 95,700 km^2. However, 1984 and 1990 were not equally covered with 75,400 and 43,500 km^2, respectively. In this survey the Subdiv. 3Pn was not sampled and the estuary strata were only well surveyed in 1987 and 1988.

In 1990 there was a change in the nGSL August survey as it was conducted on the *Alfred Needler* vessel equipped with an URI (University of Rhode Island) shrimp trawl. This survey was conducted until 2005. A comparative fishing experiment was conducted in 1990 between the *Lady Hammond*–Western IIA trawl and the *Alfred Needler*-URI trawl but conversion factors were not developed for Smooth Skate. Even for the species for which conversion factors were

estimated, they cannot be calculated for the smaller size groups, given the very different selectivity of the gears. Additional shallow strata (20 – 50 fathoms) were added at the onset of the *Alfred Needler* survey. Over the series, the surveyed area averaged 111,300 km^2, the minimum area covered was in 1990 with 95,070 km^2 and the maximum in 1995 with 119,000 km^2. Subdiv. 3Pn was sampled from 1994 to 2003 and the Lower Estuary was well covered.

In 2005, there was another change in vessel and gear for the nGSL August survey. The vessel *Teleost*, equipped with a Campelen shrimp trawl replaced the *Alfred Needler* and continues to be used to conduct this survey. Given the considerable difference in vessels and trawls, comparative fishing experiments were conducted in 2004 and 2005 to estimate the catchability difference between the two vessel/trawl tandems. These experiments were conclusive and gave conversion factors that are applied to the *Alfred Needler* catches to make them equivalent to those that would have been made in the same conditions by the *Teleost* (Bourdages et al. 2007). The combined *Needler*-URI *Teleost*-Campelen survey series is called the nGSL survey series. The abundance index derived from this nGSL survey series 1990-2010, does not include Subdiv. 3Pn since it is no longer covered by the *Teleost*. The missing year-stratum cells have been dealt with using a multiplicative model. An index of abundance was derived for Smooth Skate of all sizes and calculations were also done separately for juveniles (<48 cm) and adults (48+ cm).

Geographic distribution (*Gadus-Lady Hammond*-nGSL)

Geographic distributions of Smooth Skate in the nGSL from 1978 to 2010 are shown for the different survey series. For longer series the data have been divided into five year block intervals. These maps indicate the generalized presence of Smooth Skate in the nGSL. Smooth Skates are present in the Laurentian, Esquiman, and Anticosti channels and summer surveys indicate recurrent concentrations at the head of the Esquiman, Anticosti, and Laurentian channels. Smooth Skate is most abundant in the Lower Estuary and rarely seen in the Belle-Isle strait.

Over the 1984-2005 period, 80% of Smooth Skate are found at depths ranging from 175-350 m (Kulka et al. 2006; J. Gauthier 2006 pers. comm.).

Abundance (*Gadus*)

The area sampled by the *Gadus* winter survey 1978-1994 varied from 38,000 to 100,000 km^2. The abundance index is presented only for Div. 4R and Subdiv. 3Pn that have been well covered. Catch rates are lower in Subdiv. 3Pn with an average of 0.38 fish per tow compared to 0.59 fish per tow in Div. 4R. The abundance is quite stable over the whole period.

Length frequency distribution (*Gadus* and nGSL (*Teleost*))

Length frequency distributions were available for 1993 and 1994 of the *Gadus* survey, as well as for 1991-2010 of the nGSL survey series. The difference in selectivity for these surveys is unknown hence no comparison will be made between surveys.

The highest catch rate was observed at 37 cm.

The length distribution for the nGSL 1990-2010 survey series, shows a range from 10 to 67 cm with mostly juvenile skates below 48 cm. The maximal length is smaller during the 2006-2010 period (i.e., approx. 60 cm). This is generally comparable between the five year interval blocks

but mean number of juveniles are higher during 2006-2010 period. Catch rates and fish per tow were highest for fish of 13 cm.

Biological Data (nGSL *Teleost*)

Biological data were not systematically collected during the early surveys. However, since 1991 increasing efforts have been invested to collect more data. The sex ratio for Smooth Skate in the nGSL survey series is 1:1 (J. Gauthier 2006, pers. comm.). The length weight relationship indicates $W(g)=0.0039L(cm)^{3.25}$. Mature females are frequently observed with internal purses during the nGSL August survey.

Abundance (*Lady Hammond* and nGSL (*Teleost*))

Abundance of Smooth Skate fluctuated in the *Lady Hammond* survey and no clear trend is shown in this short series.

From 1990 to 2010 the abundance of all sizes (mean number per tow) fluctuated; however, appear to be higher than in the early 1990s.

Abundance – Immature/Mature nGSL (Teleost)

The abundance index was further divided into adults (48+ cm) and juveniles (<48 cm). The mean number of juveniles per tow is higher than adults. The difference is lower in early 1990.

Area occupied DWAO and geographic range D_{95} nGSL (*Teleost*)

Trends in area of occupancy (design-weighted area of occupancy, DWAO) were examined for the nGSL survey series (1990-2010). It indicates an increase of the area occupied over the 1990-2010 period. A similar trend is observed for the index of geographic range (D_{95}.the minimum area occupied by 95% of the population). The difference between DWAO and D_{95} corresponds to the change of vessel and gear (i.e., *Needler* to *Teleost*).

Discussion

Trends for the nGSL since 1990 are similar to the sGSL. There appears to be strong recruitment in the last decade.

It is not possible to determine whether changes in mortality and recruitment in sGNL and nGSL match as there is no nGSL data before 1990. There could be mixing between the nGSL and sGSL; however, the data do not exist to examine potential mixing.

Changes in tow duration with different gears (24 versus 15 minutes) may affect the catchability of larger skate.

The increase in the area occupied in the mid- to late 2000s may be partly an artifact of gear change. The gear used in the survey changed from a URI to a Campelen trawl in the mid-2000s. The probability of catching Smooth Skate was higher with the Campelen than with the URI trawl. Stratified mean catch rates can be adjusted for this difference, but the higher probability of catching Smooth Skate using the Campelen trawl cannot be adjusted for on a tow by tow basis. Thus, estimates of area occupied based on the Campelen trawl will be biased high relative to estimates based on the URI trawl.

Although skate purse information is not available for all regions, when catchability to the gear is consistent, as with the Campelen trawl data, the 0-group catches (Smooth Skate less than approximately 15 cm) can be used as an index of recruitment.

PLENARY DISCUSSION SMOOTH SKATE - REVIEW OF TERMS OF REFERENCE

Life History Characteristics

Growth Parameters – For length at maturity there is a lot of reliance on data not specific to geographic locations and 48 cm (decided at meeting at 2006) seems to be the one that is used unless there are additional data in each of the areas. It would be useful to compare information on length at maturity among areas, where data exist. The point was also made that the female size rather than the male size should be used.

Total mortality rates and recruitment rates – The total mortality rates were derived from the models presented by the Gulf Region. In general, for all regions not a lot of data on recruitment rates exist.

Fecundity - Fecundity data are limited. What exists can be found in McPhie and Campana (2009).

Generation Time - A participant noted that for generation time (based on age at maturity) we have to rely on the McPhie and Campana (2009) data from the Scotian Shelf as there are no data available for northern areas.

Early Life History Patterns – There was a discussion about the potential utility of using the distribution of skate purses to determine critical habitat (spawning locations). Since only the Maritimes Region have this type of information it was suggested that the distribution of 0-group (Smooth Skate less than approximately 15 cm) may be used as a proxy for spawning locations. It is not known how the mobility of young skate or the catchability of these individuals would affect the data and the utility of this information was questioned (i.e., 0-group captures as a proxy for egg distribution would be biased by any movement of those young skate). This question cannot be answered at this time.

It was asked if there is any information on annual patterns in reproduction throughout the year (important life history characteristic). In the NL region there are two surveys occurring in the spring and fall, therefore unless reproduction occurs at those times it would be missed in the survey data. Smooth Skate carrying partially or fully formed eggs were observed during both periods. A participant mentioned that there are some samples for the NL region from the commercial surveys but the data has not been analysed. There may not be enough data relevant to Smooth Skate.

In the Maritimes (Div. 4VW), the 0-group (8-15 cm) has increased since 1994. It was discussed whether this is a measure of recruitment? If it was a gear issue then it should appear post 1981, thus the increase post 1994 indicates increased recruitment. Although, this improved recruitment in juvenile stages may be a useful measure of recruitment, the recruitment to adulthood has not been examined.

Review of Designatable Units

In a 2006 COSEWIC meeting the Smooth Skate DU distribution was discussed with the options of one DU or four DUs put forward within Canadian waters. COSEWIC in its 2006 deliberations accepted the four DU scenario. The Chair proposed that the options could be debated at this

meeting and a new consensus derived from this meeting. It was pointed out that on the Scotian Shelf a separation between Div. 4VW and Div. 4X has formed in recent years.

The DU structure for Smooth Skates is primarily based on geographical separation of concentrations, not on genetics. There is little or no chance of mixing among those concentrations since Smooth Skate are never found between concentrations. It was pointed out that here we are not presenting information as DUs but rather by surveys as this is how the data is collected.

It was concluded that we would go forward with four DUs to the COSEWIC author. In Canadian waters the four DUs are Hopedale Channel, Funk Island Deep, Nose of the Grand Banks, and Laurentian-Scotian.

Describe the characteristics or elements of the species habitat to the extent possible, threats to that habitat

A caveat that should be noted is that the survey trawl coverage is over a much larger scale (temperature and depth data collection) than the species is making habitat associations. The Chair asked if other elements of habitats relating to spawning have been examined? A participant stated that there is not enough data and relating eggs or any other stage to habitat is problematic due to lack of knowledge of bottom types and a paucity of information on egg distribution.

Whelks are a predator on skate purses on the Scotian Shelf and may be a potential threat in other areas, i.e., NL region as whelk are widespread. However, there was not enough information on this issue to make a conclusion since holes in egg cases created by whelks have not been examined other than on the Scotian Shelf. Relative to some other skates the Smooth Skate have a narrow diet on crustaceans as compared to other skate, however the information does not exist to try and link habitat of prey to Smooth Skate.

Residence

It was discussed and concluded that there is no information available to identify residence of the species. As for other marine fish, the concept may not apply.

Review of COSEWIC criterion for species

It was noted that International waters are included in the NL regional surveys.

Trends in population size - Three generations of information are not available for any areas, in particular the time series for the nGSL is short and NL series is split as a result of the gear change.

Threats to abundance over last three generations - The threat from fishing in the Gulf is currently low, but mortality remains high. One hypothesis for the increased mortality on adults is an increasing grey seal population, but this mechanism is not yet proven. In Newfoundland waters the on-going Thorny Skate fishery is a limited threat to Smooth Skate as a small amount of Smooth Skate by-catch occurs. There is also a potential increase in mortality from seals in the Maritimes region but no analysis of this information was presented.

Evidence that declines have ceased, are reversible and a likely time line for reversibility - There were concerns that by presenting the decline rate as a simple decline over three generations, important changes within that time period are lost. Many of the stocks exhibit an initial decline,

stabilisation and recent recovery. One way to address this would be to analyse the survey time trends using segmented regressions, where the model chooses the break points. There was no decision made regarding this discussion.

Threats – More information is required for the nGSL region. To address threats required information should include decline rates, fishing activity information, landings, estimates of discarded catch and disaggregation of skate landings to infer the effect on Smooth Skate. Some estimates of Smooth Skate removals have been done for the NL Region. Information on fishing activity in areas where skate purses are caught, where possible, will be added for the Scotian Shelf. Species-disaggregated skate landings and discard estimates for the sGSL were not available at the meeting, but it was intended to calculate them subsequent to the meeting and provide to the COSEWIC author (available in Swain et al 2012 - see below).

A review of skate purse records should be completed for all regions. Indicators of abundance of Grey Seal population (where appropriate) and impact on adult Smooth Skate, as well large piscivorous fish such as Atlantic Cod and impact of small skate should be examined.

Potential for rescue of species from adjacent areas was discussed and does not apply to this situation. Smooth Skate do not exist in the Greenland stocks. Skate move very little and are more abundant on the Canadian side of their distribution (i.e., the US stock is also depleted).

Research Recommendations for Smooth Skate:

1. Conduct life history study on NAFO Div. 4X skate for comparison with the US information.

2. Hold an aging methodology workshop and refine regional estimates of generation time.

3. Collect and analyze genetic data in order to verify whether Designatable Units are appropriate based on factors other than geographic separation.

4. If an RPA is necessary, hold discussions in preparation regarding appropriate data and modelling approaches.

5. Need an estimate of by-catch of Smooth Skate in the nGSL.

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MEETING PROCEEDINGS THORNY SKATE

THORNY SKATE, ABUNDANCE TRENDS – NL REGION

Presenter: Mark Simpson, DFO Science, NL Region

Abstract

This paper presents the most recent information regarding the abundance, life history and distribution of Thorny Skate (*Amblyraja radiata* Donovan 1808) in Newfoundland and Labrador waters. The primary purpose of this paper is to provide this information to the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) for use in formulating and evaluating conservation and management strategies for this species in terms of risk of extinction.

Independent data series based on spring and fall bottom trawl research survey catches and commercial fisheries statistics covering the distribution of *A. radiata* in NAFO Div. 2HJ3KLMNOPs indicate that this species is widely distributed from Baffin Bay to the Laurentian Channel, but that its main stock component is consistently found on the Grand Bank over time. Research survey indices of relative abundance and distribution varied little since the 1970s in Div. 3OPs (southwestern Grand Bank and Laurentian Channel); whereas in Div. 3LN (northern and eastern Grand Bank), *A. radiata* experienced considerable declines in abundance and area occupied during the early 1990s.

Several important aspects of the life history and fisheries of *A. radiata* in the study area remain uncertain or are lacking; largely due to partial knowledge of population structure and biology, as well as the impacts of commercial fisheries and environmental variability.

Discussion

The Engel to Campelen catch rate conversions for NL region surveys was not length-based due to the lack of length data. There is a difference in size at maturity from that published by Templeman (1987) for NAFO Div. 3N and what is currently presented. It is difficult to determine if this is due to sampling, identification, or other factors. It is possible that the analysis is including maturing fish as fully mature.

THORNY SKATE, CENTRAL AND ARCTIC REGION

Author: Margaret Treble, DFO Science, Central and Arctic Region
Presenter: Mark Simpson, DFO Science, NL Region

Abstract

Thorny Skate have been identified in surveys conducted by the Central and Arctic Region in NAFO Subarea 0 (since 1999) and Hudson Strait/Ungava Bay (2007 and 2009), and by the Northern Shrimp Research Foundation (NSRF) in Shrimp Fishing Areas 2 and 3 (since 2005). Abundance of Thorny Skate in these surveys was low with total catch weights considerably less than 500 kg in most cases. Catches of Thorny Skate were rare north of 68°N and west of 74°N. There has never been a directed fishery for skate in Subarea 0; however, Thorny Skate have been reported as bycatch in the Greenland Halibut fishery (from both trawl and fixed gear fleets) and in the Northern Shrimp fishery, although at very low levels compared to more southern areas. There is limited information available to determine the current status of Thorny Skate

species in NAFO Subarea 0. However, the information provided can help inform species distribution within Canadian waters. Thorny Skate have been caught close to the boundary with Subarea 1 (Greenland waters) and Div. 2G (Newfoundland waters) and may reflect an extension of stocks from one or both of these areas.

Discussion

No discussion immediately followed this presentation.

COMMERCIAL FISHERY REMOVALS OF THORNY SKATES, 1960-2009 – NL REGION

Presenter: Carolyn Miri, DFO Science, NL Region

Abstract

Commercial fishery removals of Thorny Skate were investigated for 1960-2009. NAFO reported landings of skates are always unspeciated, and for Subareas 1, 2, and 3 were summarized on an annual basis by Division for 1960-2009 using the NAFO STATLANT-21A database. NAFO reported annual landings for all areas in 1960-1984 averaged 233 t, and 2,720 t in 1985-2008. Unreported locations include Div. 3NL and represent the highest landings: 13,279 t average in 1994-2006, 11,432 t average in 2000-2004, and 2,965 t average in 1985-2004 (respectively). Canadian reported landings within Canada's 200-mile limit in Subarea 3 were also summarized on an annual basis by Division for 1985-2009, using the DFO Zonal Interchange File Format (ZIFF) database (skates unspeciated). Canadian reported landings in Canada's EEZ were insignificant in 1985-1993. With commencement of a Canadian Thorny Skate directed fishery in 1994, otter trawls were primarily used; with 2,193 t average reported annual landings over 1994-1997, and a 596 t average in 1998-2009. Gillnets were the second most frequently used gear; with 1,009 t average landings in 1995-2003, and a 449 t average reported in 2004-2009. In 1995-2009, reported annual landings from longline gear averaged 447 t. At-sea speciated catches and discarding of Thorny Skate in Canada's EEZ were investigated by Division for 1985-2009 using the Canadian Fisheries Observer database. Observed catch estimates averaged 488 t in 1985-1991, and 1,112 t over 1992-2009. Observed discard estimates averaged 8,525 t in 1985-93, and 651 t over 1994-2009. Canadian Fisheries Observers constitute the only source of skate discard data at sea, as discarding is unreported. At-sea identification of skates remains difficult for commercial fishers; thus only "skates-unspecified" landings are reported.

Discussion

Pro-rating Observer's at-sea discards data from commercial fisheries (directed and bycatch) to total reported groundfish landings (ZIFF) by multiplying [total observed skate discards/total observed groundfish catch] to the ZIFF total reported groundfish landings, resulted in a total prorated catch with a different pattern than the ZIFF data. Another way to estimate discards would be to apply the kept to discard ratio of skates directly to the ZIFF landings. The distributions of skate catch have been previously mapped and indicate no serial depletion. Canada does not fish outside the EEZ except on rare occasion (e.g., shrimp fishery). Any fishing for skate outside the EEZ would be non-Canadian vessels.

Skate length frequencies collected by Fisheries Observers at sea in the Arctic are thought to occasionally contain other (misidentified) species. As evidenced from a few large fish which are very unlikely to be Thorny, average sizes of skate caught in NAFO Subarea 0 differ from previous studies from in Div. 0A, where the largest size was 71 cm; suggesting that a Thorny

Skate above 80 cm in Subarea 0 might be a misidentification (e.g., possibly Arctic Skate or Spinytail Skate *Bathyraja spinicauda*). However, it must be noted that Thorny Skate do reach larger sizes to the south (i.e., 90 cm total length on the Labrador Shelf, and 110 cm on the Grand Bank).

A graph was presented showing total catch of skate from the Grand Banks to the Labrador Shelf (NAFO Div. 2J3KLNOPs). Zonal Interchange kept and discard amounts as estimated from ZIF was presented by the COSEWIC author. Catch from 1985-1990 was 17 000 t, from 1991-2003 was 9000 t and from 2004-2009 was 7000 t. The relative fishing mortality (F) was very stable at about 10%.

THORNY SKATE, GEOGRAPHIC DISTRIBUTION – NL REGION

Presenter: Luiz Mello, DFO Science, NL Region

Abstract

Thorny Skate catch rates from spring (1971-2010) and fall (1977-2010) bottom trawl surveys conducted in the NL Region were plotted in relation to geographic location (NAFO Divisions), depth, and seafloor temperature. The plots support the view of the existence of one major assemblage of Thorny Skate in the study area. The assemblage is centred over the Grand Bank (Div. 3LNO) and extending into southern Newfoundland along the shelf slope (Subdiv. 3Ps), whereas mostly low fish densities were observed elsewhere, except in the Hopedale Channel (Div. 2H), where another much smaller fish assemblage was detected. Important declines in fish density and extent of distribution were observed in the northern and eastern areas of the Grand Bank (Div. 3LN) during the 1990s, which have persisted since then. In contrast, density and distribution patterns (for both spring and fall time-series) varied little in areas encompassing the southern and western Grand Bank and adjacent areas (Div. 3NOPs), as well in Div. 2HJ3KM (fall time-series). Some level of stock recovery is occurring over marginal areas (Div. 3K) and previously inhabited areas (Div. 3LN) since the early 2000s. Thorny Skate tended to be captured in deeper and broader water layers (200-600 m) in Div. 2H3KLMN, but in shallower and narrower layers (50-300 m) in Div. 3OPs and were infrequently recorded in tows below 1000 m. Thorny Skate were distributed in waters varying on average from -1.1 to 7.1°C, but tended to be found in preferential temperature ranges, which changed according to latitudinal and longitudinal clines.

Discussion

A bi-modal distribution of skate in relation to depth, peaks at 200-300 m and again at 400-500 m. This may be related to different sizes distributing at different depths. These data requires disaggregating by size and sex. It is also possible that the fall survey catch distributions show characteristics of both the typical summer shallow distribution and winter deep distribution.

THORNY SKATE, 4VWX - MARITIMES REGION

Presenter: Jim Simon, DFO Science, Maritimes Region

Abstract

The status of Thorny Skate within the Maritimes Region was reviewed by examining data from DFO RV surveys, US RV surveys, Canadian industry science surveys, observer information from directed fisheries, and fisheries landings. DFO RV data suggests that Thorny Skate were

widespread across the Scotian Shelf and Bay of Fundy with the highest concentration in Div. 4V and the Bay of Fundy prior to 1990. Since the 1990s, there has been a dramatic reduction in the distribution of Thorny Skate on the central Scotian Shelf and the concentrations in the east and west are much reduced. Industry science surveys suggests that there is still significant connectivity between these areas. An examination of the length frequencies collected during the summer RV survey indicate a progressive loss of the largest individuals in the population so that there are very few fish greater than 53 cm caught by the survey. The decline in abundance across the shelf of mature fish is 96%, while the decline when all lengths are considered is 82%. While these declines have occurred, recruitment of fish less than 21 cm has remained steady since 1970. Thorny Skate are distributed on Georges Bank primarily on the edges of the northeast peak of the bank and in the deeper waters north of the Great Southwest Channel. Both US RV surveys both suggest that Thorny Skate are found throughout the Gulf of Maine and that the distribution observed during the Canadian survey in this area simply reflects the southern edge of this population. There are no directed fisheries for Thorny Skate on the Scotian Shelf; although they are caught as bycatch in other fisheries. In Div. 4X, an examination of these other fisheries suggests that annual Thorny Skate bycatch was relatively stable at approximately 1750 t from 1970 to 1992. Bycatch estimates declined in the 1990s as catches in the traditional cod, Haddock, Pollock, and flatfish fisheries were reduced. In the last decade, removals have been less than half of what had been taken previously. In Div. 4VsW, bycatch of Thorny Skate prior to 1992 was approximately 4500 t and declined subsequently to 170 t per year due to the closures of the cod and haddock fisheries as well as changes in the Silver Hake fishery. Collectively, these data suggest that Thorny Skate abundance, especially mature abundance, is currently very low on the Scotian Shelf and Georges Bank area. These declines are continuing on the eastern Scotian Shelf despite dramatic reductions in fishing effort and steady recruitment. In Div. 4X, Thorny Skate abundance has continued to decline despite the reduction in removals by greater than half and steady recruitment over the last 15 years.

Discussion

With respect to threats, there were similar decline rates on the western Scotian Shelf (Div. 4X) and eastern Scotian Shelf (Div. 4VW); however, fishing effort has increased in recent years in Div. 4X and decreased in Div. 4VW. It is unlikely that this is a result of movement from one area to the other, which may suggest that there are additional threats beyond fishing in Div. 4VW.

There appears to be a contraction of distribution in the early 1990s. This may be a result of the incursion of cold waters, and a temperature driven distribution hypothesis fits with the shift from Div. 4W to Div. 4V. It was suggested that changes in community composition may be affecting skate distribution. It was noted that within the region of the Haddock closed box the size distribution of Haddock has changed with changes in growth so that there are few large Haddock.

THORNY SKATE IN THE SOUTHERN GULF OF ST. LAWRENCE – GULF REGION

Presenter: Doug Swain, DFO Science, Gulf Region

Abstract

Information on life history traits, trends in the abundance and distribution, and threats to persistence were presented for Thorny Skate (*Amblyraja radiata*) in the sGSL. A bottom-trawl survey, conducted each September since 1971, is the main source of information on the abundance and distribution of Thorny Skate in this area. This survey has broad coverage of the southern Gulf, extending from depths less than 20 m to those near 400 m. Analyses were

restricted to the 24 strata fished since 1971, with adjustments to account for one or two missed strata in 1978, 1983, 1988, and 2003. Differences in fishing efficiency for Thorny Skate between the four vessels or two gears (Yankee-36 and Western IIA bottom trawls) used to conduct this survey over its 40 year history were estimated using comparative fishing experiments. Based on the results of these experiments, catch rates by the *E.E. Prince* (1971-1985) and *Lady Hammond* (1985-1991) were divided by 1.465 and 1.512, respectively, to maintain comparability with catch rates by the *Alfred Needler* (1992-2005, except 2003) and *Teleost* (2004-present). Catchability of Thorny Skate to the survey was greater at night, and night catches were adjusted to day catchability using length-dependent adjustments to maintain comparability with data from the 1971-1984 surveys (when fishing was in day only).

Thorny Skate in the sGSL are fairly slow growing, with a mean length of 43.8 cm for skates ten years of age. Estimated lengths and ages at 50% maturity are 49.7 cm and 12.3 years for females and 50.5 cm and 11.9 years for males. These lengths at 50% maturity are similar to those reported by Templeman (1987) for Thorny Skate in this area in the 1950-1970 period.

Thorny Skate has historically been the most abundant and widespread skate in the sGSL. Thorny Skate overwinter in relatively deep water along the slope of the Laurentian Channel, moving into shallower water in summer, when they were typically widely dispersed throughout the Magdalen Shallows. However, a striking contraction in the September distribution of both juveniles and adults occurred in the 1990s and the 2000s, with distribution now largely restricted to the slope of the Laurentian Channel and northeastern regions of the Magdalen Shallows. The area occupied by mature skates in recent years is only 10% of the area occupied early in the time series. Although the September distribution has contracted into deeper water, there is no indication that availability of Thorny Skate to the survey has declined as a result of this contraction; the density of Thorny Skate is very low in the deep water along and beyond the margin of the survey area.

Abundance of adult skate (skates >50 cm in total length) in the sGSL has declined steadily since the beginning of the time series in 1971. The estimated decline since 1971 is 95%, and there is no indication that this decline has ceased. In contrast to the adult sizes, juvenile skates (≤50 cm) increased in abundance in the mid to late 1980s, were at a high level from the late 1980s to the mid-1990s and then declined sharply, followed by a sharp increase in abundance since the mid-2000s. The high abundance of juvenile skates in the early to mid-1990s and the mid- to late 2000s was entirely due to high abundance of skate less than 40 cm in length.

Trawlable abundance is the mean catch per standard tow expanded to the survey area. Because catchability of skates to the survey gear is expected to be less than 100%, trawlable abundance is expected to be less than true abundance. Estimated trawlable abundance of mature Thorny Skates declined from about 1 million fish in the 1971-1975 to 62,000 fish in 2006-2010 using catch rates adjusted to day catchability by the *Alfred Needler* and *Teleost*, and 1.9 million fish to 144,000 fish using catch rates adjusted to the average between day and night catchability by the *Lady Hammond*.

There is no directed fishery for skates in the sGSL. Skate landings are not disaggregated to species. Reported landings are very low (<10 t in most years) and are likely mostly Thorny Skate. However, most of the skate catch is discarded at sea, and estimates of the discarded catch of Thorny Skate were not available for this meeting. Fishing effort for groundfish in the sGSL has been very low since the mid-1990s. Thus, while bycatch mortality may have been an important component of Thorny Skate mortality prior to the mid-1990s, it has likely been low since then.

The survey abundance trends for juvenile- and adult-sized skates suggest that mortality decreased for juveniles and increased for adults in the 1990s and 2000s. A similar pattern is seen throughout the marine fish community of the sGSL. This is consistent with the hypotheses of release of small fish from predation following the collapse of large demersal fish and increased predation mortality of large fish due to increased Grey Seal abundance.

Discussion

There is a high mortality of adults and a low mortality in juveniles. Reasons are uncertain. Predation of skate by other fish has not been looked at in the Gulf but a study from the Scotian Shelf shows there was little skate predation by other fish. It was questioned whether increased mortality of adults may be a result of a paucity of key prey items, however there is no shortage of forage species in the Gulf and skate condition is good.

It was questioned whether skate may be moving from one region to another, either across the Laurentian Channel (less likely), or along the channel. Currently there is no evidence with which to test this hypothesis. It was noted that similar changes in depth distribution occurred simultaneously in all areas. The usefulness of genetic research to answer this question was doubted as most techniques resolve difference on longer timelines (1000s of years) and would hence not reveal any recent adaptive changes.

THORNY SKATE, THE NORTHERN GULF OF ST. LAWRENCE, 1978-2010

Author: Brigitte Bernier, DFO Science, Gulf Region
Presenter: Doug Swain, DFO Science, Gulf Region

Abstract

For the nGSL, four different annual bottom trawl groundfish surveys have been examined as part of this review. In general, the surveyed area includes the NAFO Div. 4RS, the Subdiv. 3Pn as well as strata deeper than 100 fathoms in Div. 4T. The sampling methodology follows a depth-stratified random survey design. These series are not easily comparable due to many variables changing overtime: vessel, gear, time of year, and surveyed area. Catches for each survey series were adjusted to respective survey standard tow.

The *Gadus Atlantica* survey was conducted yearly in January from 1978-1994 with an Engels 145 trawl (no survey in 1982). The area surveyed was highly variable over the series, mainly due to ice cover. The average area covered is 62,550 km^2 with the smallest area in 1992 of 31,737 km^2 and the largest in 1980 with 100,400 km^2. There was good coverage of Subdiv. 3Pn and Div. 4R over the series while Div. 4T and Div. 4S were more variable. The estuary (strata 409 – 414) was not surveyed. The survey ended in 1994.

The *Lady Hammond* survey took place in August from 1984-1990. This survey used a Western IIA trawl. The total surveyed area was fairly constant from 1985-1989 averaging 95,700 km^2. However, 1984 and 1990 were not equally covered at 75,400 and 43,500 km^2, respectively. In this survey Subdiv. 3Pn was not sampled and the estuary strata were only well covered in 1987 and 1988.

In 1990 there was a change in the nGSL August survey as it was conducted on the *Alfred Needler* vessel equipped with an URI shrimp trawl. This survey was conducted until 2005. A comparative fishing experiment was conducted in 1990 between the *Lady Hammond*–Western IIA trawl and the *Alfred Needler*-URI trawl but conversion factors were not developed for Thorny Skate. Even for the species for which conversion factors were estimated, they cannot be

calculated for the smaller size groups, given the very different selectivity of the gears. Additional shallow strata (20 – 50 fathoms) were added at the onset of the *Alfred Needler* survey. Over the series, the surveyed area averaged 111,300 km^2, the minimum area covered was in 1990 with 95,070 km^2 and the maximum in 1995 with 119,000 km^2. The Subdiv. 3Pn was sampled from 1994 to 2003 and the Lower Estuary was well covered.

In 2005, there was another change in vessel and gear for the nGSL August survey. The vessel *Teleost*, equipped with a Campelen shrimp trawl replaced the *Alfred Needler* and continues to be used to conduct this survey. Given the considerable difference in vessels and trawls, comparative fishing experiments were conducted in 2004 and 2005 to estimate the catchability difference between the two vessel/trawl tandems. These experiments were conclusive and gave conversion factors that are applied to the *Alfred Needler* catches to make them equivalent to those that would have been made in the same conditions by the *Teleost* (Bourdages et al. 2007). The combined *Needler*-URI *Teleost*-Campelen survey series is called the nGSL survey series. The abundance index derived from this nGSL survey series 1990-2010, does not include Subdiv. 3Pn since it is no longer covered by the *Teleost*. The missing year-stratum cells have been dealt with using a multiplicative model. An index of abundance was derived for Thorny Skate of all sizes and calculations were also done separately for juveniles (≤50cm) and adults (>50 cm).

Geographic distribution (*Gadus-Lady Hammond*-nGSL)

Geographic distributions of Thorny Skate in the nGSL from 1978 to 2010 are shown for the different survey series. For longer series the data have been divided into five year block intervals. These maps indicate the generalized presence of Thorny Skate in the nGSL. Thorny Skates are present in the Laurentian, Esquiman, and Anticosti channels and summer surveys indicate recurrent concentrations at the head of the Esquiman, Anticosti, and Laurentian channels. Thorny Skate is most abundant in the Lower Estuary and rarely seen in the Belle-Isle strait.

The nGSL survey series (1990-2006) indicates that 80% of the Thorny Skate are found at depths ranging from 150-330 m. The mean number per tow peaked at 150-200 m and between 1 and 2°C (J. Gauthier 2006, pers. comm.).

Abundance (*Gadus*)

The area sampled by the *Gadus* winter survey 1978-1994 varied from 38,000 to 100,000 km^2. The abundance index is presented only for Div. 4R and Subdiv. 3Pn that have been well covered. Catch rates are lower in Subdiv. 3Pn with an average of 1.4 fish per tow compared to 3.4 in Div. 4R. The abundance is quite stable over the whole period.

Length frequency distribution (*Gadus* and nGSL (*Teleost*))

Length frequency distributions were available for 1993 and 1994 of the *Gadus* survey, as well as for 1991-2010 of the nGSL survey series. The difference in selectivity for these surveys is unknown hence no comparison will be made between surveys.

The size range for Thorny Skate in the *Gadus* survey was between 10-76 cm with the highest catch rate at 25 cm.

The length distribution for the nGSL 1990-2010 survey series shows a range between 10-67 cm with mostly juvenile skate below 50 cm. This is comparable between the five year interval blocks. Catch rates and fish per tow were highest for 13 cm fish.

Biological Data (nGSL *Teleost*)

Biological data were not systematically collected during the early surveys. However since 1991 increasing efforts have been invested to collect more data. The sex ratio for Thorny Skate in the nGSL survey series is 1:1. The length weight relationship indicates $W(g)=0.0039L(cm)^{3.25}$.

Mature females are frequently observed with internal purses during the nGSL August survey.

Abundance (*Lady Hammond* and nGSL (*Teleost*))

Abundance of Thorny Skate fluctuated in the *Lady Hammond* survey with no clear trend for this short series.

From 1990 to 2010, the abundance of Thorny Skates of all sizes (mean number per tow) fluctuated without any clear trend.

Abundance – Immature/Mature nGSL (*Teleost*)

The abundance index was further divided into adults (>50 cm) and juveniles (≤50 cm). The mean number of Thorny Skate juveniles per tow is around 8 times higher than adults.

Area occupied (DWAO) and geographic range (D_{95}) nGSL (*Teleost*)

Trends in area of occupancy (design-weighted area of occupancy, DWAO) were examined for the nGSL survey series (1990-2010). It indicates an increase of the area occupied since 1990 with a maximum of 93,000 km^2 in 2008. A similar trend is observed for the index of geographic range (D_{95}.the minimum area occupied by 95% of the population). The difference between DWAO and D_{95} corresponds to the change of vessel and gear (i.e., *Needler* to *Teleost*).

Discussion

Adult skate are decreasing in the sGSL (Div. 4T) and increasing in the nGSL (Div. 4RS), accordingly it was questioned whether skate in Div. 4T are part of a larger Gulf stock. Given the very low densities in the deep portions of the Laurentian Channel it seems likely that associations would be stronger along the slopes of the channel than across it. Consequently it is more likely that Thorny Skate in Div. 4T would be associated with skate along the north coast of the Gaspé than those on the other side of the channel. Likewise a closer linkage would be expected with those in Subdiv. 4Vn. Tagging data would be required to look at this question.

Declines are occurring in all areas south of the Laurentian Channel. After discussion there was no consensus whether this is one population with re-distribution and localised area effects on mortality or more than one population with different drivers. Some evidence for the latter is the increase in juveniles in Div. 4T since juveniles are unlikely to have migrated into the region.

PLENARY DISCUSSION THORNY SKATE - REVIEW OF TERMS OF REFERENCE

Life history characteristics

The discussion on life history characteristics led to the following suggested additional work be required: 1) Examination of the number of recruits (7-17 cm) for all regions (recruitment), 2) Characterisation of current life history traits and how these have changed relative to the earlier values reported by Templeman (1987), 3) Investigation of the spatial component of life history traits, size and seasonal habitat preferences, and 4) Information on egg cases distribution, 5) information on fecundity.

Review of Designated Units

There are no obvious geographical breaks in Thorny Skate distribution; however, there are differences in life history traits and abundance trends among areas. A division along the Laurentian Channel may be appropriate although there is no break in distribution there. This potential Southern DU would consist of Div. 4TVWX. It was pointed out that there is a cline in size at maturity even within the Newfoundland region. Thorny Skate are not very migratory and there is little dispersal of larval stages so re-population from adjacent areas is less likely. There was no consensus regarding a potential Southern DU and further discussions focused on the one DU for Thorny Skate.

Any attempt to aggregate data from different areas (and in some cases time periods) needs to take into account effects related to the different gears used among surveys and regions.

Review COSEWIC criteria

COSEWIC uses decline in population abundance over three generations as key information in determining at risk status (i.e., as opposed to small population size, restricted distribution, etc.).

There is an issue with the use of a size based single break point for defining the adult population as it does not consider between region variation in size at maturity. Maturity occurs at a smaller size northward but a single break point for mature versus immature has been used. This biases the results with more immature fish included in the adult estimate as we move northward. It was suggested that if this approach was continued results should be labelled with size group (e.g.,>55 cm) as opposed to maturity status. This is mostly a problem for the NL region where size at maturity has a latitudinal cline. The use of a single break point for the whole of the southern portion of the DU was rejected, and regions will continue to use the most appropriate (regional) estimate of the break point. Overall population trends are available for all regions. Abundance in the southern portion of this DU (i.e., the Div. 4TVWX area) has declined by over 90% since 1970, abundance in the nGSL has increased since 1990 and abundance trends in NL are variable.

These trends in adult abundance assume that length at maturity is constant over time and are thus biased if there has been a change in size at maturity. For some areas, this assumption seems reasonable (e.g., the sGSL, where current estimates of length at 50% maturity are similar to those reported by Templeman (1987) for the 1950-1970 period). For some other areas, length at maturity may have been larger historically; in these cases, the current approach is precautionary.

Threats including fishing mortality are adequately outlined in the working papers. Threats vary between regions.

The question was raised whether there is evidence that declines have ceased. There is no indication that the decline has ceased in the southern portion of the DU (Div. 4TVWX area). It is unknown if a decline is reversible, as it is still on-going. It is important to highlight that there is a portion of the mortality that is not understood. In the sGSL component of this DU, juvenile abundance has increased despite declining adult abundance and increased juvenile abundance has not resulted in subsequent increases in adult abundance. In the nGSL and NL the population is stable, noting that adults on the Grand Banks did increase since the mid-1990s.

Habitat and threats to habitat

An analysis of catch rate distribution in relation to depth and temperature was presented. There are no known spawning or nursery grounds associated with depth and temperature preferences, however skates may have preferred spawning areas that are not yet identified. The best approach is to collect internal morphological data (e.g., maturity stages of gonads) to suggest when and where reproduction occurs. Currently there is no spatial analysis conducted for egg case development in NL region, but this could be done in the future. Egg cases are carried for short periods of time (typically less than 24 hours), so plotting locations of females with encased eggs may be a useful first step to defining spawning locations.

There have been dramatic changes in distribution in Div. 4T. A number of mechanisms have been explored including effects of temperature changes, however temperature patterns have returned to normal in the last 10 years with no return of skate to shallow waters. The current untested hypothesis relates to predator avoidance.

There are no strong functional limits of habitat evident (i.e., habitat does not appear to be limiting). However, a caveat that should be noted is that the survey trawl coverage is over a much larger scale (temperature and depth data collection) than the species is making habitat associations.

Within a limited area of activity, the proposed oil and gas exploration in the nGSL and sGSL along the Laurentian Channel may pose a threat to habitat.

Residence

Currently there has been no identification of residence for this species and it is not expected that it would be identified or that it exists.

Threats

Fishing is a threat that has been greatly reduced in some areas but is continuing in others. In the NL region most skate are taken in the directed fishery, but there are no evident declines associated with the fishery in recent years. With regard to skate taken and released as bycatch, survivability after capture is very limited with the best case scenario of 50% survival rate. Relative F on the Grand Banks is flat, suggesting no adverse effect of removals. In the Gulf Region there is no directed fishery and bycatch has decreased due to an overall decrease in fishing effort, so there is likely a minimal effect. On the Scotian Shelf, Thorny Skate are taken as by-catch in high value fisheries such as halibut and cod. The quota for directed fisheries is generally not taken when markets are poor.

Environmental change (e.g., water temperature) and predation were briefly discussed at the meeting but quantitative information on these potential threats was not presented. It was recommended that temperature indices and trends in the abundance of potential predators should be included in research documents where possible and appropriate.

With respect to changes in community structure, in the Gulf there has been an increase in the abundance of small prey species in recent periods, suggesting higher availability of prey and lower competition. Predators such as Grey Seals are also at high levels which could potentially increase the threats to skate in the region.

Rescue effect

The potential of rescue from the northern US to the southern DU would be limited. The area of the Nose and Tail of the Grand Bank could provide rescue into Canadian waters. There is also the potential of rescue from West Greenland; however, the status of these adjacent stocks is uncertain at this time.

FUTURE DISCUSSIONS FOR SMOOTH AND THORNY SKATES: REQUIREMENTS FOR AN RPA?

Following a discussion on stock assessment models, it was suggested that a Bayesian modelling approach was the best choice to allow for tracking abundance indices and projecting uncertainties in the data and also to bring in information from other areas.

It was suggested that Bayesian surplus production models may be problematic. Using length-based stage structured models was a suggested approach.

In order to run these models, abundance indices by stage (i.e., juvenile or adult) are required, as well as information on growth, fecundity and egg case mortality. Models will likely have to assume constant growth over time, and a sensitivity analysis should be done to determine the sensitivity of conclusions to this assumption.

In order to apportion total mortality into fishing and natural mortality, information is required on discards and associated mortality. Unless catches are substantial, it will be difficult to scale population estimates (i.e., estimate catchability by stage). In this case, it may be necessary to adjust abundance indices for size selectivity and ideally estimate actual catchability to the survey gear prior to population modelling (e.g., using an approach like that in Harley and Myers (2001)).

The main items that require work include: aging, growth, estimates of landed or discarded catch, and associated uncertainty. A process for addressing problems of species identification is required and the determination of discard rates as a function of effort in other fisheries. Also required is work on size selectivity of trawls on various skate sizes. It is unclear what can be done for the nGSL where data has not been collected in the past. One possibility is to use Div. 3NOPs information to fill in missing information in the nGSL. If it is assumed that areas are independent, then estimates will be generated by region and then combined. An overall model approach, as well unified models for each of the DUs are ultimately required. Basic scripts could be developed with R and Winbugs.

References:

Bourdages, H., Savard, L., Archambault, D., and Valois, S. 2007. Results from the August 2004 and 2005 comparative fishing experiments in the northern Gulf of St. Lawrence between CCGS *Alfred Needler* and the CCGS *Teleost*. Can. Tech. Rep. Fish. Aquat. Sci. 2750. 57 p.

Harley, S.J., and Myers, R.A. 2001. Hierarchical Bayesian models of length-specific catchability of research trawl surveys. Can. J. Fish. Aquat. Sci. 58:1569-1584.

Templeman, W. 1987. Differences in sexual maturity and related characteristics between populations of Thorny Skate (*Raja radiata*) in the Northwest Atlantic. J. Northw. Atl. Fish. Sci. 7: 155-167.

APPENDIX 1 - TERMS OF REFERENCE

Thorny Skate and Smooth Skate Pre-COSEWIC Peer Review Meeting

Zonal Advisory Process – Central and Arctic, Gulf, Maritimes, Newfoundland and Labrador, Quebec

January 11-13, 2011
St. John's, Newfoundland and Labrador

Chair: Keith Clarke, Environmental Science Section, Science Branch, NL Region

Context

The implementation of the federal *Species at Risk Act* (SARA), proclaimed in June 2003, begins with an assessment of a species' risk of extinction by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). COSEWIC is a non-government scientific advisory body that has been established under Section 14(1) of SARA to perform species assessments which provide the scientific foundation for listing species under SARA. Therefore, an assessment initiates the regulatory process whereby the competent Minister must decide whether or not to accept COSEWIC's assessment and add a species to Schedule 1 of SARA, which would result in legal protection for the species under the Act. If the species is already on Schedule 1 of SARA, the Minister may decide to keep the species on the list, reclassify it as per the COSEWIC assessment, or to remove it from the list (Section 27 of SARA).

Two species of skate, *Malacoraja senta* and *Amblyraja radiate*, have been listed by COSEWIC for assessment. DFO, as a generator and archivist of information on marine species, is to provide COSEWIC with the best information available to ensure that an accurate assessment of the status of a species can be undertaken.

Meeting Objectives

The overall objective of this meeting is to peer-review DFO information relevant to the COSEWIC status assessment for *Malacoraja senta* and *Amblyraja radiata* in Canadian waters, considering data related to the status and trends of, and threats to these species inside and outside of Canadian waters, and the strengths and limitations of the information. This information will be made available to COSEWIC, the author(s) of the species status report, and the co-chairs of the applicable COSEWIC Species Specialist Subcommittee. Output from the peer-review meeting (see below) will be posted on the CSAS website.

Specifically, DFO information relevant to the following will be reviewed to the extent possible:

1) Life history characteristics

- Growth parameters: age and/or length at maturity, maximum age and/or length
- Total and natural mortality rates and recruitment rates (if data is available)
- Fecundity
- Generation time
- Early life history patterns

- Specialised niche or habitat requirements

2) Review of Designatable Units

Available information on population differentiation, which could support a COSEWIC decision of which populations below the species' level would be suitable for assessment and designation, will be reviewed. Information on morphology, meristics, genetics and distribution will be considered and discussed.

See COSEWIC 2008 "Guidelines for Recognizing Designatable Units below the Species Level" (http://www.cosewic.gc.ca/eng/sct2/sct2_5_e.cfm).

3) Review the COSEWIC criteria for the species in Canada as a whole, and for each Designatable Unit identified (if any):
(http://www.cosewic.gc.ca/eng/sct0/assessment_process_e.cfm)

COSEWIC Criterion – Declining Total Population

a. Summarize overall trends in population size (both number of mature individuals and total numbers in the population) over as long a period as possible and in particular for the past three generations (taken as mean age of parents). Additionally, present data on a scale appropriate to the data to clarify the rate of decline.

b. Identify threats to abundance - where declines have occurred over the past three generations, summarize the degree to which the causes of the declines are understood, and the evidence that the declines are a result of natural variability, habitat loss, fishing, or other human activity.

c. Where declines have occurred over the past three generations, summarize the evidence that the declines have ceased, are reversible, and the likely time scales for reversibility.

COSEWIC Criterion – Small Distribution and Decline or Fluctuation: for the species in Canada as a whole, and for Designatable Units identified, using information in the most recent assessments:

a. Summarise the current extent of occurrence (in km^2) in Canadian waters

b. Summarise the current area of occupancy (in km^2) in Canadian waters

c. Summarise changes in extent of occurrence and area of occupancy over as long a time as possible, and in particular, over the past three generations.

d. Summarise any evidence that there have been changes in the degree of fragmentation of the overall population, or a reduction in the number of meta-population units.

e. Summarise the proportion of the population that resides in Canadian waters, migration patterns (if any), and known breeding areas.

COSEWIC Criterion – Small Total Population Size and Decline and Very Small and Restricted: for the species in Canada as a whole, and for Designatable Units identified, using information in the most recent assessments:

a. Tabulate the best scientific estimates of the number of mature individuals;

b. If there are likely to be fewer than 10,000 mature individuals, summarize trends in numbers of mature individuals over the past 10 years or three generations, and, to the extent possible, causes for the trends.

Summarise the options for combining indicators to provide an assessment of status, and the caveats and uncertainties associated with each option.

For transboundary stocks, summarise the status of the population(s) outside of Canadian waters. State whether rescue from outside populations is likely.

4) Describe the characteristics or elements of the species habitat to the extent possible, and threats to that habitat

Habitat is defined as "in respect of aquatic species, spawning grounds and nursery, rearing, food supply, migration and any other areas on which aquatic species depend directly or indirectly in order to carry out their life processes, or areas where aquatic species formerly occurred and have the potential to be reintroduced".

The phrasing of the following guidelines would be adapted to each specific species and some could be dropped on a case-by-case basis if considered biologically irrelevant. However, these questions should be posed even in cases when relatively little information is expected to be available, to ensure that every effort is made to consolidate whatever knowledge and information does exist on an aquatic species' habitat requirements, and made available to COSEWIC.

a) Describe the functional properties that a species' aquatic habitat must have to allow successful completion of all life history stages.

In the best cases, the functional properties will include both features of the habitat occupied by the species and the mechanisms by which those habitat features play a role in the survivorship or fecundity of the species. However, in many cases the functional properties cannot be described beyond reporting patterns of distribution observed (or expected) in data sources, and general types of habitat feature known to be present in the area(s) of occurrence and suspected to have functional properties. Information will rarely be equally available for all life history stages of an aquatic species, and even distributional information may be missing for some stages. Science advice needs to be carefully worded in this regard to clearly communicate uncertainties and knowledge gaps.

b) Provide information on the spatial extent of the areas that are likely to have functional properties.

Where geo-referenced data on habitat features are readily available, these data could be used to map and roughly quantify the locations and extent of the species' habitat. Generally however, it should be sufficient to provide narrative information on what is known of the extent of occurrence of the types of habitats identified. Many information sources, including Aboriginal Traditional Knowledge (ATK) and experiential knowledge, may contribute to these efforts.

c) Identify the activities most likely to threaten the functional properties, and provide information on the extent and consequences of those activities.

COSEWIC's operational guidelines require consideration of both the imminence of each identified threat, and the strength of evidence that the threat actually does cause harm to the species or its habitat. The information and advice from the Pre-COSEWIC review should

provide whatever information is available on both of those points. In addition, the information and advice should include at least a narrative discussion of the magnitude of impact caused by each identified threat when it does occur.

d) Recommend research or analysis activities that are necessary

Usually the work on the other Guidelines will identify many knowledge gaps.

Recommendations made and enacted at this stage in the overall process could result in much more information being available should a RPA (Recovery Potential Assessment) be required for the species.

5) Describe to the extent possible whether the species has a residence as defined by SARA

SARA s. 2(1) defines Residence as "a dwelling-place, such as a den, nest or other similar area or place, that is occupied or habitually occupied by one or more individuals during all or part of their life cycles, including breeding, rearing, staging, wintering, feeding or hibernating."

6) Threats

A threat is any activity or process (both natural and anthropogenic) that has caused, is causing, or may cause harm, death, or behavioural changes to a species at risk or the destruction, degradation, and/or impairment of its habitat to the extent that population-level effects occur. Guidance is provided in: *Environment Canada, 2007. Draft Guidelines on Identifying and Mitigating Threats to Species at Risk. Species at Risk Act Implementation Guidance.*

List and describe threats to the species considering:

- Threats need to pose serious or irreversible damage to the species. It is important to determine the magnitude (severity), extent (spatial), frequency (temporal) and causal certainty of each threat.
- Naturally limiting factors, such as aging, disease and/or predation that limit the distribution and/or abundance of a species are not normally considered threats unless they are altered by human activity or may pose a threat to a critically small or isolated population.
- Distinction should be made between general threats (e.g. agriculture) and specific threats (e.g. siltation from tile drains), which are caused by general activities.
- The causal certainty of each threat must be assessed and explicitly stated as threats identified may be based on hypothesis testing (lab or field), observation, expert opinion or speculation.

7) Other

Finally, as time allows, review status and trends in other indicators that would be relevant to evaluating the risk of extinction of the species. This includes the likelihood of imminent or continuing decline in the abundance or distribution of the species, or that would otherwise be of value in preparation of COSEWIC Status Reports.

Working Paper(s)

Working papers addressing the above Terms of Reference will be submitted for review.

Output of the meeting

The final version of the minutes of the meeting will be part of the CSAS Proceedings series. CSAS Research Documents are expected from the working papers submitted for review.

Participation

Participation is expected from:

- Relevant DFO Sectors
- COSEWIC status report author

Participation may also include:

- Industry
- Aboriginal groups
- Environmental Non-Government Organizations (ENGOs)
- Academia
- Provincial Governments
- Other invited external experts as deemed necessary

References

Kulka, D.W., Swain, D., Simpson, M.R., Miri, C.M., Simon, J., Gauthier, J., McPie, R., Sulikowski, J., and Hamilton, L. 2006. Distribution, abundance, and life history of *Malacoraja senta* (Smooth Skate) in Canadian waters with reference to its global distribution. DFO Can. Sci. Advis. Sec. Res. Doc. 2006/093.

ANNEXE 1 - CADRE DE REFERENCE

Réunion d'examen par des pairs pré-COSEPAC concernant la raie épineuse et la raie à queue de velours

Processus de consultation scientifique zonal – Centre et Arctique, Golfe, Maritimes, Terre-Neuve et Labrador, Québec

Du 11 au 13 janvier 2011
St. John's, Terre-Neuve et Labrador

Président: Keith Clark, Division des sciences environnementales, Direction des sciences, Région de T.-N.L.

Contexte

La première étape de l'application de la *Loi sur les espèces en péril* (LEP), promulguée en juin 2003, consiste en une évaluation, par le Comité sur la situation des espèces en péril au Canada (COSEPAC) du risque de disparition d'une espèce. Le COSEPAC, un organisme scientifique consultatif indépendant, a été constitué en vertu du paragraphe 14(1) de la LEP. Son rôle consiste à effectuer des évaluations d'espèces qui serviront de fondement scientifique pour l'inscription de celles-ci à la liste de la LEP. L'évaluation déclenche le processus réglementaire au terme duquel le ministre compétent doit décider ou non d'accepter la désignation établie par le COSEPAC et d'inscrire l'espèce en question à l'annexe 1 de la LEP, ce qui signifie que l'espèce est protégée en vertu de la Loi. Si l'espèce est déjà inscrite à la liste de l'annexe 1 de la LEP, le ministre peut décider de maintenir son inscription, de procéder à un nouveau classement selon l'évaluation du COSEPAC ou de la radier de la liste (article 27 de la LEP).

Deux espèces de raies, à savoir *Malacoraja senta* et *Amblyraja radiata*, doivent faire l'objet d'une évaluation par le COSEPAC. Le MPO, en tant que producteur et archiviste de l'information sur les espèces marines, doit fournir au COSEPAC la meilleure information disponible pour que ce dernier puisse évaluer de façon précise la situation des espèces.

Objectifs

L'objectif général de la présente réunion est d'effectuer un examen par des pairs du MPO de l'information concernant l'évaluation de la situation par le COSEPAC de *Malacoraja senta* et de *Amblyraja radiata* dans les eaux canadiennes, en tenant compte des données sur l'état des espèces et des tendances qu'elles affichent, des menaces pesant sur celles-ci à l'intérieur et à l'extérieur des eaux canadiennes de même que des points forts et des limites de l'information. L'information sera fournie au COSEPAC, aux auteurs des rapports de situation sur les espèces ainsi qu'aux co-présidents du sous-comité de spécialistes des espèces du COSEPAC concerné. Les résultats de cette réunion d'examen par des pairs (voir ci-après) seront publiés sur le site Web du SCCS.

Dans la mesure du possible, l'accent sera mis plus particulièrement sur l'information dont dispose le MPO par rapport aux points qui suivent.

1) Caractéristiques du cycle biologique

- Paramètres de croissance : âge ou longueur à la maturité, âge maximal ou longueur.
- Taux de mortalité totale et naturelle et taux de recrutement (si des données sont disponibles).
- Fécondité.
- Durée de génération.
- Caractéristiques des premiers stades du cycle biologique.
- Besoins particuliers en matière de niche ou d'habitat, y compris l'habitat essentiel.

2) Examen des unités désignables

On procèdera à l'examen de l'information disponible sur la différentiation des populations, ce qui pourrait aider le COSEPAC à prendre une décision quant aux populations inférieures à l'espèce qu'il conviendrait d'évaluer et de désigner. On examinera également l'information sur la morphologie, les caractéristiques méristiques, la génétique et la répartition.

Voir les *Lignes directrices pour reconnaître les unités désignables inférieures à l'espèce* 2008 du COSEPAC (http://www.cosewic.gc.ca/fra/sct2/sct2_5_f.cfm).

3) Examen des critères du COSEPAC pour l'espèce dans l'ensemble du Canada et pour chaque unité désignable établie (le cas échéant).
(http://www.cosewic.gc.ca/fra/sct0/assessment_process_f.cfm)

Critères du COSEPAC – Population totale en déclin

a. Résumer les tendances générales quant à l'effectif (nombre d'individus matures et population totale) sur la plus longue période possible, en particulier depuis les trois dernières générations (où une génération correspond à l'âge moyen des parents). En outre, présenter les données sur une échelle appropriée pour expliquer le taux de déclin.

b. Relever les menaces pesant sur l'abondance – lorsqu'un déclin est survenu au cours des trois dernières générations, résumer dans quelle mesure les causes du déclin sont comprises ainsi que les éléments prouvant qu'il découle de la variabilité naturelle, de la perte d'habitat, de la pêche ou d'autres activités humaines.

c. Lorsqu' un déclin est survenu au cours des trois dernières générations, résumer les éléments prouvant sa fin et sa réversibilité, en précisant les échelles temporelles probables de cette réversibilité.

Critère du COSEPAC – Faible répartition et déclin ou fluctuation – pour l'espèce dans l'ensemble du Canada et les unités désignables précisées, en utilisant l'information présentée dans les évaluations les plus récentes.

a. Indiquer la superficie actuelle de la zone d'occurrence (en km2) dans les eaux canadiennes.

b. Indiquer la superficie actuelle de la zone d'occupation (en km2) dans les eaux canadiennes.

c. Indiquer les changements dans les superficies des zones d'occurrence et d'occupation sur la plus longue période possible, en particulier pour les trois dernières générations.

d. Indiquer tous les éléments prouvant qu'il y a eu des changements dans le degré de fragmentation de l'ensemble de la population ou une réduction du nombre d'unités de métapopulation.

e. Indiquer la proportion de la population qui se trouve dans les eaux canadiennes, les profils de migration (le cas échéant) et les aires de reproduction connues.

Critère du COSEPAC – **« Petite taille de la population totale et déclin » et « très petite population ou répartition restreinte »** – pour l'espèce dans l'ensemble du Canada et les unités désignables précisées, en utilisant l'information présentée dans les évaluations les plus récentes.

a. Présenter, dans un tableau, les meilleures estimations scientifiques du nombre d'individus matures.

b. S'il y a vraisemblablement moins de 10 000 individus matures, indiquer les tendances quant au nombre de ces individus depuis les dix dernières années ou les trois dernières générations et, dans la mesure du possible, les causes de ces tendances.

Résumer les options de combinaisons d'indicateurs permettant d'évaluer la situation de l'espèce ainsi que les mises en garde et les incertitudes associées à chaque option.

En ce qui concerne les stocks transfrontaliers, résumer la situation de la ou des populations à l'extérieur des eaux canadiennes. Préciser si une immigration d'individus de populations extérieures est probable.

4) Décrire les caractéristiques ou éléments de l'habitat de l'espèce dans la mesure du possible et les menaces à cet habitat.

L'habitat se définit comme suit : s'agissant d'une espèce aquatique, frayères, aires d'alevinage, de croissance et d'alimentation et routes migratoires dont sa survie dépend, directement ou indirectement, ou aires où elle s'est déjà trouvée et où il est possible de la réintroduire.

Le libellé des lignes directrices suivantes doit être adapté à chaque espèce, et certains éléments peuvent être éliminés s'ils sont considérés comme non pertinents sur le plan biologique. Cependant, afin de s'assurer que tous les efforts sont consentis pour consolider les connaissances et les données disponibles sur les exigences en matière d'habitat d'une espèce aquatique et que cette information soit fournie au COSEPAC, il faut que les lignes directrices soient appliquées, même lorsqu'on s'attend à ce qu'il y ait très peu d'information disponible.

a. Décrire les propriétés fonctionnelles que doit présenter l'habitat aquatique de l'espèce pour assurer le bon déroulement de tous les stades de son cycle biologique.

Dans les meilleurs cas, les propriétés fonctionnelles engloberont les caractéristiques de l'habitat occupé par l'espèce ainsi que les mécanismes par lesquels ces caractéristiques de l'habitat jouent un rôle dans la survie ou la fécondité de l'espèce. Cependant, dans de nombreux cas, les propriétés fonctionnelles ne pourront être exposées que par une description des profils de répartition observés (ou attendus) dans les sources de données et les types généraux de caractéristiques de l'habitat présentes dans les aires d'occurrence et qui pourraient avoir des propriétés fonctionnelles. L'information sera rarement disponible dans les mêmes proportions pour tous les stades du cycle biologique d'une espèce aquatique, et il est même possible que de l'information sur la répartition soit manquante pour certains stades. L'avis scientifique doit donc être rédigé avec prudence à cet égard afin que les incertitudes et les lacunes dans les connaissances soient clairement précisées.

b. Fournir de l'information sur l'étendue spatiale des zones susceptibles de présenter des propriétés fonctionnelles.

Lorsqu'on dispose de données géoréférencées sur les caractéristiques de l'habitat, on peut les utiliser pour situer et quantifier approximativement l'habitat en question. En général, cependant, il suffit de fournir de l'information narrative sur ce que l'on sait quant à l'étendue de l'occurrence des types d'habitats relevés. De nombreuses sources d'information, y compris les connaissances traditionnelles autochtones et les connaissances expérientielles, peuvent être mises à profit.

c. Relever les activités les plus susceptibles de menacer les propriétés fonctionnelles et fournir de l'information sur l'ampleur et les conséquences de ces activités, y compris les menaces pesant sur l'habitat essentiel.

Les lignes directrices opérationnelles du COSEPAC exigent que l'on tienne compte de l'imminence de chaque menace relevée et de la valeur de la preuve soutenant que la menace cause effectivement un tort à l'espèce ou à son habitat. L'information et l'avis découlant de l'examen préalable à l'évaluation du COSEPAC doivent couvrir toute l'information disponible sur ces deux sujets. En outre, l'information et l'avis doivent comporter au moins un exposé narratif de l'ampleur de l'impact causé par chaque menace relevée, si celle-ci se concrétise.

d. Formuler des recommandations au sujet d'activités de recherche ou d'analyses nécessaires.

D'ordinaire, les travaux effectués en vertu des autres lignes directrices permettent de relever de nombreuses lacunes dans les connaissances.

Les recommandations formulées et mises en œuvre à cette étape du processus global peuvent faire en sorte que beaucoup plus d'information soi disponible si une EPR (évaluation du potentiel de rétablissement) est requise pour l'espèce.

5) Décrire, dans la mesure du possible, si l'espèce a une résidence telle que définie par la LEP

La LEP, paragraphe 2 (1), définit la résidence comme étant : un « gîte – terrier, nid ou autre aire ou lieu semblable — occupé ou habituellement occupé par un ou plusieurs individus pendant tout ou partie de leur vie, notamment pendant la reproduction, l'élevage, les haltes migratoires, l'hivernage, l'alimentation ou l'hibernation ».

6) Menaces

Une menace est une activité ou un processus (naturel ou anthropique) qui a causé, qui cause ou peut causer une atteinte grave à un individu d'une espèce en péril, sa mort ou des modifications de son comportement, ou la détérioration, la destruction et/ou la perturbation de son habitat jusqu'à entraîner des répercussions au niveau de la population. Des lignes directrices se trouvent dans : Environnement Canada, 2007. Version provisoire des lignes directrices pour l'identification et l'atténuation des menaces pesant sur les espèces en péril. Guide de mise en œuvre de la *Loi sur les espèces en péril.*

Énumérer et décrire les menaces pesant sur l'espèce en considérant :

- que les menaces doivent causer des dommages graves ou irréversibles à l'espèce. Il est important de déterminer l'ampleur (gravité), l'étendue (spatiale), la fréquence (temporelle) et la certitude causale de chaque menace;
- que les facteurs limitatifs naturels, tels que le vieillissement, la maladie ou la prédation qui limitent la répartition ou l'abondance d'une espèce, ne sont pas normalement considérés comme des menaces à moins qu'ils n'aient été modifiés par l'activité humaine ou qu'ils puissent poser une menace pour une population extrêmement petite ou isolée;
- qu'une distinction doit être établie entre les menaces générales (p. ex. agriculture) et les menaces particulières (p. ex. envasement provoqué par les drains agricoles) causées par des activités générales;
- que la certitude causale de chaque menace doit être évaluée et mentionnée de façon explicite, car les menaces indiquées peuvent être fondées sur la vérification d'hypothèses (en laboratoire ou sur le terrain), des observations, des opinions d'experts ou des prévisions.

7) Autres

Finalement, si le temps le permet, passer en revue l'état et les tendances concernant d'autres indicateurs qui pourraient être utiles pour évaluer le risque de disparition de l'espèce ou qui, d'une autre façon, seraient pertinents pour la rédaction des rapports de situation du COSEPAC. Mentionnons à cet égard la probabilité d'un déclin imminent ou la poursuite d'un déclin au chapitre de l'abondance ou de la répartition de l'espèce.

Documents de travail

Les documents de travail se rapportant au cadre de référence ci-devant seront examinés :

Résultats de la réunion

La version finale du compte rendu de la réunion sera ajoutée à la série des comptes rendus du SCCS. On s'attend également à ce que les documents de travail examinés soient publiés en tant que documents de recherche du SCCS.

Participants

Les intervenants attendus à la réunion sont :

- des représentants des secteurs du MPO concernés;
- l'auteur du rapport de situation du COSEPAC.

Les intervenants attendus peuvent également comprendre :

- des représentants de l'industrie;
- des représentants de groupes autochtones;
- des représentants d'ONGE;
- des représentants d'universités;
- d'autres experts externes invités au besoin.

Références

Kulka, D. W., Swain, D., Simpson, M. R., Miri, C. M., Simon, J., Gauthier, J., McPie, R., Sulikowski, J., and Hamilton, L. 2006. Distribution, abundance, and life history of *Malacoraja senta* (Smooth Skate) in Canadian waters with reference to its global distribution. DFO Can. Sci. Advis. Sec. Res. Doc. 2006/093.

APPENDIX 2 - PROPOSED AGENDA/ ORDRE DU JOUR PROPOSÉ

DFO Zonal Advisory Process (ZAP): Pre-COSEWIC for Thorny and Smooth Skate

Processus de consultation scientifique zonal du MPO (PCSZ) préalable à l'évaluation du COSEPAC de la raie épineuse et de la raie à queue de velours

Comfort Inn, 106 Airport Road, St. John's, NL
January 11-13, 2011

Comfort Inn, 106 Airport Road, St. John's, T.-N.L.
Du 11 au 13 janvier 2011

Chairperson: Keith Clarke, Environmental Science Section, DFO, NL Region/

Président : Keith Clarke, Division des sciences environnementales, MPO, Région de T.-N.L.

January 11, 2011/ Le 11 janvier 2011

09h00	**Opening remarks (introduction of Chair, rapporteur, presenters and proposed agenda)/ Remarques préliminaires (présentation du président, du rapporteur, des présentateurs et de l'ordre du jour proposé)**	Chair/ Président
09h30	Smooth Skate NL Region/ Raie à queue de velours, Région de T.-N.L.	M. Simpson C. Miri
10h30	**Coffee break/ Pause-café**	
10h45	Smooth Skate NL Region/ Raie à queue de velours, Région de T.-N.L.	L. Mello
11h30	Smooth Skate Central and Arctic Region (presented by NL Region)/ Raie à queue de velours, Région du Centre et de l'Arctique (présenté par la Région de T.-N.L.)	M. Simpson
12h00	**Lunch Break/ Repas du midi**	
13h00	Smooth Skate Gulf Region/ Raie à queue de velours, Région du Golfe	D. Swain
14h00	Smooth Skate Maritimes Region/ Raie à queue de velours, Région des Maritimes	J. Simon S. Rowe
15h00	**Coffee Break/ Pause-café**	
15h15	Smooth Skate Quebec Region/ Raie à queue de velours, Région du Québec	D. Swain
15h45	Smooth Skate/ Raie à queue de velours	Plenary/ Séance plénière
17h00	**End of day/ Fin de la journée**	

January 12, 2011/ Le 12 janvier 2011

09h00	Smooth Skate/ Raie à queue de velours	Plenary/ Séance plénière
10h30	**Coffee break/ Pause-café**	
10h45	Smooth Skate Wrap-up/Raie à queue de velours, synthèse	Plenary/ Séance plénière
12h00	**Lunch Break/ Repas du midi**	
13h00	Thorny Skate NL Region/ Raie épineuse, Région de T.-N.L.	M. Simpson C. Miri L. Mello
15h00	**Coffee Break/ Pause-café**	
15h15	Thorny Skate Central and Arctic Region (presented by NL Region/ Raie épineuse, Région du Centre et de l'Arctique (présenté par la Région de T.-N.L).	M. Simpson
16h00	Thorny Skate Maritimes Region/ Raie épineuse, Région des Maritimes	J. Simon S. Rowe
17h00	**End of day/ Fin de la journée**	

January 13, 2011/ Le 13 janvier 2011

09h00	Thorny Skate Gulf Region/ Raie épineuse, Région du Golfe Thorny Skate Quebec Region/ Raie épineuse, Région du Québec	D. Swain
10h30	**Coffee break/ Pause-café**	
10h45	Thorny Skate Gulf Region (con't)/ Raie épineuse, Région du Golfe (suite) Thorny Skate Quebec Region (con't)/ Raie épineuse, Région du Québec (suite)	D. Swain
11h30	Thorny Skate/ Raie épineuse	Plenary/ Séance plénière
12h00	**Lunch Break/Repas du midi**	
13h00	Thorny Skate/ Raie épineuse	Plenary/ Séance plénière
15h00	**Coffee Break/ Pause-café**	
15h15	Thorny Skate Wrap-up/ Raie épineuse, synthèse	Plenary/ Séance plénière
16h15	Future Discussions/ Discussions à venir	Plenary/ Séance plénière
17h00	**Close meeting/ Levée de la réunion**	

APPENDIX 3 - PARTICIPANT LIST

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